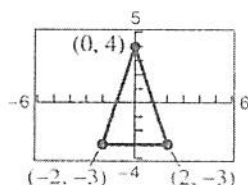
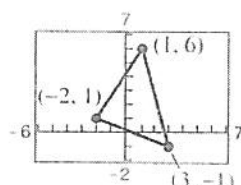


#1-10 use a determinant to find the area of the triangle with the given vertices

1.



2.



3.  $(0, 0), (1, 5), (3, 1)$

4.  $(0, 0), (4, 5), (5, -2)$

5.  $(0, \frac{1}{2}), (\frac{5}{2}, 0), (4, 3)$

6.  $(0, 4), (2, 3), (5, 0)$

7.  $(4, 5), (6, 1), (7, 9)$

8.  $(0, -2), (-1, 4), (3, 5)$

9.  $(-3, 5), (2, 6), (3, -5)$

10.  $(-2, 4), (1, 5), (3, -2)$

11.  $(-5, 1), (0, 2), (-2, x)$

12.  $(-4, 2), (-3, 5), (-1, x)$

13.  $3x + 4y = -2$

14.  $-0.4x + 0.8y = 1.6$

$5x + 3y = 4$

$0.2x + 0.3y = 2.2$

15.  $4x - y + z = -5$

16.  $4x - 2y + 3z = -2$

$2x + 2y + 3z = 10$

$2x + 2y + 5z = 16$

$5x - 2y + 6z = 1$

$8x - 5y - 2z = 4$

17.  $3x + 3y + 5z = 1$

18.  $2x + 3y + 5z = 4$

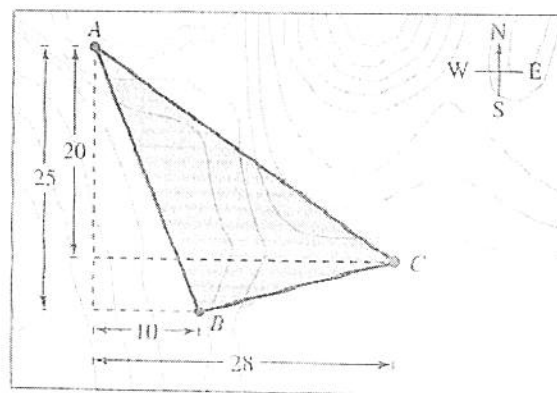
$3x + 5y + 9z = 2$

$3x + 5y + 9z = 7$

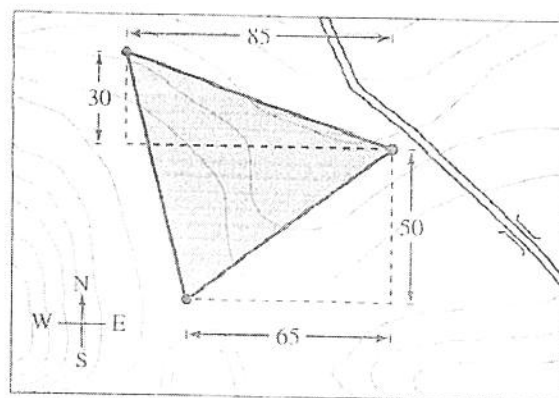
$5x + 9y + 17z = 4$

$5x + 9y + 17z = 13$

19. *Area of a Region* A large region of forest has been infected with gypsy moths. The region is roughly triangular, as shown in the figure. From the northernmost vertex  $A$  of the region, the distances to the other vertices are 25 miles south and 10 miles east (for vertex  $B$ ), and 20 miles south and 28 miles east (for vertex  $C$ ). Use a graphing utility to approximate the number of square miles in this region.



20. *Area of a Region* You own a triangular tract of land, as shown in the figure. To estimate the number of square feet in the tract, you start at one vertex, walk 65 feet east and 50 feet north to the second vertex, and then walk 85 feet west and 30 feet north to the third vertex. Use a graphing utility to determine how many square feet there are in the tract of land.



#21-26 use the determinant to decide if the points are collinear

21.  $(3, -1), (0, -3), (12, 5)$   
 22.  $(-3, -5), (6, 1), (10, 2)$   
 23.  $(2, -\frac{1}{2}), (-4, 4), (6, -3)$   
 24.  $(0, 1), (4, -2), (-8, 7)$   
 25.  $(0, 2), (1, 2.4), (-1, 1.6)$   
 26.  $(2, 3), (3, 3.5), (-1, 2)$

In #27-32 use the determinant to find an equation of a line through the points.

27.  $(0, 0), (5, 3)$       28.  $(0, 0), (-2, 2)$   
 29.  $(-4, 3), (2, 1)$       30.  $(10, 7), (-2, -7)$   
 31.  $(-\frac{1}{2}, 3), (\frac{5}{2}, 1)$       32.  $(\frac{2}{3}, 4), (6, 12)$

33.  $(2, -5), (4, x), (5, -2)$   
 34.  $(-6, 2), (-5, x), (-3, 5)$

Message

Matrix

35. TROUBLE IN RIVER CITY  $\begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ -6 & 2 & 3 \end{bmatrix}$   
 36. PLEASE SEND MONEY  $\begin{bmatrix} 4 & 2 & 1 \\ -3 & -3 & -1 \\ 3 & 2 & 1 \end{bmatrix}$

39. HAPPY BIRTHDAY

40. OPERATION OVERLORD

$$41. A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$$

11, 21, 64, 112, 25, 50, 29, 53, 23, 46, 40, 75, 55, 92

$$42. A = \begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ -6 & 2 & 3 \end{bmatrix}$$

9, -1, -9, 38, -19, -19, 28, -9, -19, -80, 25,  
 41, -64, 21, 31, 9, -5, -4

In Exercises 43 and 44, decode the cryptogram by using the inverse of the matrix.

43. 20, 17, -15, -12, -56, -104, 1, -25, -65, 62, 143, 181

44. 13, -9, -59, 61, 112, 106, -17, -73, -131, 11, 24, 29, 65, 144, 172

45. The following cryptogram was encoded with a  $2 \times 2$  matrix.

8, 21, -15, -10, -13, -13, 5, 10, 5, 25,  
 5, 19, -1, 6, 20, 40, -18, -18, 1, 16

The last word of the message is \_RON. What is the message?

46. The following cryptogram was encoded with a  $2 \times 2$  matrix.

5, 2, 25, 11, -2, -7, -15, -15, 32,  
 14, -8, -13, 38, 19, -19, -19, 37, 16

The last word of the message is \_SUE. What is the message?

37. LANDING SUCCESSFUL  
 38. BEAM ME UP SCOTTY